

Wednesday  
November 16, 1983

Registered

Part III

Environmental  
Protection Agency

Municipal Wastewater Treatment;  
Secondary Treatment Information and  
National Pollutant Discharge Elimination  
System; Proposed Rules

# ENVIRONMENTAL PROTECTION AGENCY

## 40 CFR Part 133

[WH-FRL-2410-5]

### Secondary Treatment Information

**AGENCY:** Environmental Protection Agency (EPA).

**ACTION:** Proposed rule with request for comments.

**SUMMARY:** This proposed rule amends the secondary treatment information regulation to reflect changes required by section 23 of the "Municipal Wastewater Treatment Construction Grant Amendments of 1981," (Pub. L. 97-117) and experience with the secondary treatment requirements by both EPA and the States. The proposed rule would make the following changes in response to the Act:

- Define a category of facilities eligible for treatment equivalent to secondary treatment as those facilities that use a trickling filter (TF) or waste stabilization pond (WSP) treatment process and provide significant biological treatment of wastewater, but cannot consistently meet secondary treatment requirements.
- Define the minimum level of effluent quality attainable by such facilities during a 30-day period as an average value not to exceed 45 milligrams per liter (mg/l) for the pollutant parameters biochemical oxygen demand, 5-day (BOD<sub>5</sub>) and suspended solids (SS), an average 7-day value for BOD<sub>5</sub> and SS not to exceed 65 mg/l, and a percentage removed of BOD<sub>5</sub> and SS not less than 65 percent.
- Provide procedures by which NPDES permitting authorities may establish alternative effluent requirements for facilities providing treatment equivalent to secondary treatment.
- Require that the case-by-case adjustment of individual POTW permits for such facilities reflect the performance or design capabilities of the facility, and assure that water quality is not adversely affected, where treatment equivalent to secondary treatment is provided, and
- Remove the 2 million gallons per day (mgd) flow limitation for WSPs eligible for adjustment of suspended solids effluent limitations.

This proposed rule would also add a definitions section to the secondary treatment information regulation for key terms and make minor editorial changes. Such changes are not substantive in nature. Unchanged regulatory language

is also being printed in this proposal for the sake of completeness to the reader.

This proposed rulemaking does not make any change in the existing 85 percent removal requirement. However, in response to comments on various options for modifying the requirement which are discussed later in this preamble, the Agency intends to promulgate one or a combination of the options discussed. Interested readers are directed to the discussion in Section X and the Comments Invited section of this preamble.

**DATES:** Written comments on this proposed rule must be submitted on or before January 16, 1984.

**ADDRESSES:** Comments on this proposed rule should be addressed to: Central Docket Section [A-130], Attention: Docket No. G-81-3, Environmental Protection Agency, Washington, D.C. 20460.

The public may inspect the complete record for this rulemaking and all comments received on this proposed rule at: Central Docket Section, Gallery 1, West Tower Lobby, Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. between the hours of 8:00 a.m. and 4:30 p.m., business days.

In accordance with Section 3504(h) of the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.* EPA has submitted a copy of this proposed rule, and supporting documents for a collection of information requirements to the Director of OMB for review and approval. Comments on the information requirements of this proposed rule may be sent to: Office of Management and Budget, Office of Information and Regulatory Affairs, Attention: Desk Officer, EPA, 726 Jackson Place, Washington, D.C. 20503.

**FOR FURTHER INFORMATION CONTACT:** Charles Moor, Office of Water Program Operations [WH-595], Environmental Protection Agency, Washington, D.C. 20460, (202) 382-7276.

**SUPPLEMENTARY INFORMATION:** The SUPPLEMENTARY INFORMATION section of this preamble describes the legal authority, background, technical and other aspects of the proposed regulations. The abbreviations, acronyms, and other terms used in the SUPPLEMENTARY INFORMATION section are defined in Appendix A of this notice.

These proposed regulations are supported by technical documents available from EPA. An overview of the design criteria, performance, reliability and limitations of biological treatment systems is provided in "Innovative and Alternative Technology Assessment Manual," [EPA 430/9-78-009, MCD-53, 1980]. Data collection efforts,

performance analyses for various biological treatment systems and the methodologies used to develop this proposal are discussed in docket materials available for public inspection at the location indicated in the ADDRESSES section of this preamble, and in the "Technical Support Document for Proposed Regulations under Section 304(d)(4)," September 1983, which may be obtained from Office of Water Program Operations, Facility Requirements Division (WH-595), Environmental Protection Agency, 401 M Street SW, Washington, D.C. 20460: (202) 382-7271.

The Agency is also publishing in today's Federal Register a proposed rule for separate changes to the secondary treatment regulation that concern the optional use of alternative effluent limitations for five day carbonaceous biochemical oxygen demand (CBOD<sub>5</sub>) instead of BOD<sub>5</sub>. The potential use of CBOD<sub>5</sub> effluent limitations for TFs and WSPs is discussed in that proposal.

Also proposed elsewhere in today's Federal Register are revisions to permit program requirements for the National Pollutant Discharge Elimination System (NPDES) that would allow NPDES permits to be modified or reissued to reflect the limits required by the proposed revisions to the secondary treatment regulation.

Information in this preamble is presented in the following order:

- I. Introduction
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  - B. The 1981 Amendments—Section 23 of Pub. L. 97-117
    1. Provisions and Legislative History
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- III. Overview of Biological Treatment Systems
  - A. Biological Treatment Systems for Achieving Secondary Treatment
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  - C. Types of Biological Treatment Systems in Use
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- VI. Effluent Quality Attainable through Treatment Equivalent to Secondary Treatment
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    1. Inability of Facility to Consistently Achieve Secondary Treatment

which readily consume organic matter, whereas the nitrification process is carried out by very specialized bacteria, which are slow-growing and generally present in wastewater only in small numbers. The typical time required to double a population of nitrifying bacteria is one day, while a typical time for doubling a population of carbonaceous microorganisms is usually one to two hours.

#### *B. Oxygen Demand Considerations in the Design of Secondary Treatment Facilities and the Application of Secondary Treatment*

Biological wastewater treatment facilities achieve a reduction in oxygen-demanding materials by utilizing the activities of bacteria and other microorganisms as part of the treatment process. In most cases, the wastewater treatment processes are designed and operated to maintain a relatively stable population of microorganisms and to remove reliably specific oxygen-demanding materials.

Table 1 illustrates levels of pollutant reduction typically achieved in applying primary treatment, secondary treatment, and nitrification processes. For untreated domestic wastewater, the largest source of oxygen-demanding materials (approximately 75%) is carbonaceous in nature. As shown in Table 1, most of the carbonaceous material is removed during the application of secondary treatment. These materials are metabolized by carbonaceous microorganisms:

Although a small amount of nitrogenous material is also consumed as a nutrient, most of the residual oxygen-demanding materials in secondary effluent is nitrogenous in nature. Additional facilities beyond secondary, e.g., a nitrification process, are usually designed when it is desirable to remove these remaining materials. (As noted in Section II C of this preamble, nitrification with attendant nitrogen-ammonia oxidation may also occur in certain secondary treatment facilities, although secondary treatment processes are not generally designed for this purpose.)

TABLE 1.—TYPICAL INFLUENT AND EFFLUENT WASTEWATER CHARACTERISTICS

(All values in milligrams per liter)

Type	CBOD <sub>5</sub>	CBOD <sub>u</sub>	NH <sub>3</sub> -N	NOD <sub>5</sub>	UOD
Influent	200	300	20	92	392
Primary	130	195	20	92	287
Secondary	20-30	30-45	12-18	55-83	85-128
Nitrification	5-10	10-15	2	9	19-26

Design practices and operating procedures for secondary treatment facilities are based primarily on carbonaceous microorganisms metabolizing the carbonaceous fraction (CBOD) of the wastewater. Design equations for secondary treatment are based on carbonaceous oxidation in regard to sludge production, solids inventory, air requirements and effluent residuals [cf. Water Pollution Control Federation and American Society of Civil Engineers, "Wastewater Treatment Plant Design," (Lancaster press, Lancaster, PA), 1977; Metcalf and Eddy, Inc., "Wastewater Engineering: Collection, Treatment, Disposal," (New York: McGraw-Hill), 1972]. Where biological treatment is proposed to achieve secondary treatment levels, the use of intentional nitrification is not usually recommended. This process may adversely affect sludge settling and other desirable sludge characteristics. Also, the additional capital costs to provide sufficient detention times or aeration to sustain adequate populations of nitrifying bacteria can be significant. Standard design practices for secondary treatment facilities thus encourage oxidation and removal of only carbonaceous organic material.

The focus on CBOD in the design and operation of secondary treatment facilities directly contrasts with design and operation of most advanced treatment facilities, where both CBOD and NOD reduction is desired. In advanced treatment, the design of the facility will often maximize nitrification in the treatment process, and the design equations for the treatment processes will take into account the oxygen demands from both CBOD and NOD.

The impact of NOD on the dissolved oxygen in the receiving waters is an important factor in evaluating the need for advanced treatment. If the use of secondary treatment is sufficient for attainment of the water quality standards, then the receiving waters are classified as effluent limited. In such cases, a wasteload allocation, modeling output, or other water quality analyses should have determined that the potential NOD impacts of the municipal discharge on dissolved oxygen in the receiving waters will not violate water quality standards. When the effluent exerts sufficient NOD to lower dissolved oxygen levels below established limits, advanced treatment, usually nitrification, will be required in addition to secondary treatment. In these cases, receiving waters are classified as water quality limited.

Based on the above considerations, the CBOD parameter represents the best

measure of oxygen-demanding materials in secondary effluent and efficiency of a secondary treatment process. Since standard engineering practices for design and operation of secondary treatment facilities usually minimize nitrification, and since the practice of classifying receiving waters as effluent limited obviates the need for ammonia nitrogen control, the Agency believes that the control and measurement of effluent NOD is largely an incidental byproduct for certain biological secondary treatment facilities.

#### *C. Problems Arising from Use of BOD Parameter*

Since 1973 the Agency has specified BOD<sub>5</sub> as the parameter for limiting the oxygen demand in municipal wastewater influents and effluents. Although the parameter BOD<sub>5</sub> can include both a CBOD and an NOD fraction, until a few years ago this was generally not viewed as a problem in monitoring the effluent quality of a secondary treatment facility.

As noted above, the design of secondary treatment facilities inherently minimizes the growth of nitrifiers. Thus, under most circumstances, the effluent sample from secondary treatment facilities at or near design loadings will contain small numbers of nitrifying bacteria. This is especially true during cold weather months when nitrifier growth rates are minimal.

In a standard BOD test (5-day incubation at 20°C, 7.2 pH), the degree of NOD exerted will depend upon the population of nitrifying bacteria that are initially present in the sample. The 5-day period is generally too short for growth of the small initial population of nitrifying bacteria normally present in secondary effluents to numbers sufficient to exert a significant NOD. Under these conditions little of the ultimate NOD will be exerted during a 5-day test; therefore, the BOD<sub>5</sub> test will primarily measure the carbonaceous biochemical oxygen demand.

A significant population of nitrifying bacteria may be present in the effluent sample if there is sufficient nitrifier growth in the wastewater treatment facility to cause incipient or partial nitrification. In these cases, a substantial portion of the NOD<sub>5</sub> may be exerted within the 5-day test. Thus, the standard BOD<sub>5</sub> test will measure both CBOD<sub>5</sub> and NOD, although the NOD parameter is irrelevant for most secondary treatment facilities.

Incipient, partial, or full nitrification can occur where a secondary treatment facility is designed based on overly conservative criteria, or the facility is

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